# CEPT Workshop on new spectrum solutions for industry sectors

## An overview of ECC activities on M2M via satellites

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17/04/ 2019

# Content

**Background & history**

**Draft ECC report on M2M via satellites**

- **Current report structure & definitions**
- **Role of Satellites in M2M/IoT eco-system**
- **Market perspective and IoT requirements**
- **Satellite operations**
- **Hybrid systems**
- **New system based on SRD framework**
- **Preliminary findings**
- **Next steps**

**Panorama of ECC activities on M2M and the IoT**



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# Background and history

## ECC#40 M2M Report

M2M can be used in a number of frequency bands, using a number of services and radio applications, under both a licensing and exempt framework. This provides a number of options and that no single frequency band defines M2M (i.e. no single frequency band should be viewed in isolation) per se. (Doc. ECC(15)039 – Annex 13)

## WGFM#88 CG Report on M2M via Satellite

in 2016 a Correspondence Group carried out an initial study on the need and opportunities to develop specific measures to foster or enable the development of hybrid systems combining connectivity solutions from terrestrial networks operated in SRD bands and satellite networks (FM(17)095)

## WI FM44_33

- Assess the feasibility of M2M/IoT operation through satellite from a technical and regulatory point of view.
- Develop an ECC Report regarding the implementation of M2M/IoT operation via satellite including uplinks and downlinks to enhance terrestrial networks with satellite connectivity (FM(17)127-Annex 08 )

# Draft ECC report on M2M via satellites (1/8)

## *M2M, MTC, mMTC, IoT, IoE ? A wide range of definitions exist! Some examples*

ITU-T: IoT is “a global infrastructure for the information society, enabling advanced services by interconnecting physical and virtual) things based on existing and evolving interoperable information and communication technologies.“

ETSI: ETSI TR 102 725 V1.1.1 (2013-06): defines M2M Communications as Physical telecommunication based interconnection for data exchange between two ETSI M2M compliant entities, like: device, gateways and network infrastructure

**Initial views expressed in the draft ECC report on M2M via satellite is that : “fixing a definition of M2M communications or MTC as distinct from IoT only makes a crucial difference when market requirements or regulatory obligations explicitly depend on that distinction. In this report the terms MTC, M2M and IoT are used as equivalents”**

## Draft report structure





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# Draft ECC report on M2M via satellites (2/8)

## *Role of Satellites in M2M/IoT eco-system*

**A wide range of applications**: Satellite networks already address a large number of M2M applications (e.g transport, government services, energy…)

**Global, mobile and narrowband applications** : M2M/IoT satellite services are mostly based on low throughput and mobile solutions below 3GHz.

**US$1.5 billion revenue** : Global retail revenue of M2M/IoT over satellites in 2017 was estimated around US$1.5 billion

**Broadband & IoT/M2M communications**: M2M/IoT satellite solutions are also growing in higher frequency bands where industry needs for broadband and M2M communications can be met via a single terminal/access point (e.g. aircraft & vessel communications, mining operations…)

**Nanosatellite constellation**: Decrease in the cost of satellite launch and nanosatellite technologies are enabling new systems dedicated to Satellite IoT applications



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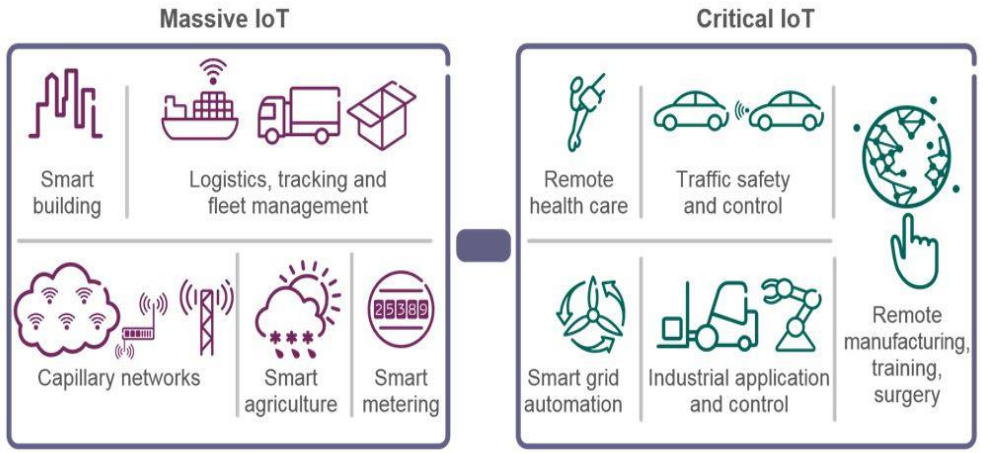
# Draft ECC report on M2M via satellites (3/8)

## *Market perspectives and IoT requirements*

- New connectivity demand is driven by the expansion of existing industries that rely heavily on satellite M2M services as well as new applications arising with 5G development
- Retail revenue of M2M/IoT over satellites is expected to increase to US$2.6 billion in the next 10 years(1) and the related number of devices should reach 10 million by 2027.
- IoT/M2M domains cover almost all vertical sectors and the wide range of IoT applications can be translated in a range of operational requirements

**Satellite will be needed to support various capabilities, supplement terrestrial networks and meet expected coverage and reliability requirements for a growing IoT ecosystem**




| Massive communications | Critical communications |
|---|---|
| Operational requirements | |
| Low device cost | |
| Simple cheap devices | Ultra-reliability |
| Low energy consumption | High availability |
| Small data volumes | Potentially uninterrupted communications |
| Intermittent uses | Real-time communications |
| Can tolerate signal latency | Very low signal latency |
| Massive number of devices | Guaranteed in-time delivery |
| Extended coverage | |

(1) Northern Sky Research, M2M and IoT via satellite, 9th Edition, September, 2018



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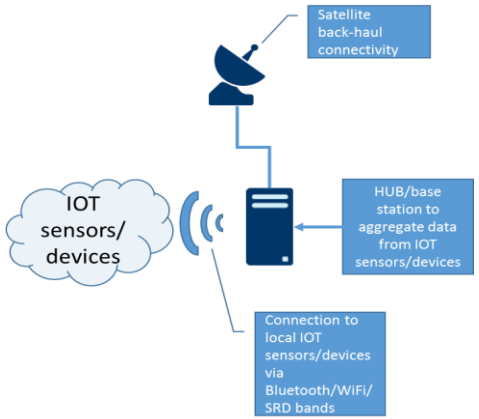
# Draft ECC report on M2M via satellites (4/8)

## *Satellite M2M/IoT operations in standalone mode*

Satellite M2M services in standalone mode are already widespread throughout traditional satellite bands (VHF/UHF, L, C, Ku, Ka) and are delivered by both NGSO and GSO constellations

### IoT backhauling

Satellite connectivity expands the possibility of base stations deployment in remote areas and enables the development of local area networks in specific points of interest




### Direct Access

- Mostly operated in MSS bands below 3GHz
- Different satellite network topologies exist which can cover the whole range of M2M/IoT requirements
- Modern satellites have the ability to reconfigure their mission and allocate part of their available frequency bands to new M2M/IoT applications
- Development of new waveforms for satellite communication that would require significantly less energy to operate and extend the operational time of sensors and M2M equipment,



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# Draft ECC report on M2M via satellites (5/8)

## *Hybrid satellite and terrestrial systems*

Dual-mode IoT terminals enabling radio communications through different satellite and terrestrial technologies and frequency bands exist already. Beyond this traditional approach, new scenarios to further enhance networks integration are considered in the draft ECC report.

| Level of integration | Identification of the integration scenario | Description |
|---|---|---|
| Less integrated  More integrated | Integrated solution implemented within a frequency range with frequency separation. | Both satellite and terrestrial networks operate within a designated frequency range which is split in two dedicated sub frequency bands respectively for satellite and terrestrial communications. This can also be accomplished in adjacent satellite/terrestrial frequency bands. |
| | Integrated solution in a shared spectrum based on a static planning of the usage of the frequency band | Satellite and terrestrial networks operate in the same frequency band. Interferences within the frequency band are statically managed thanks to a coordinated planning of the usage of the band. |
| | Integrated solution in a shared spectrum based on a dynamic planning of the usage of the frequency band | Satellite and terrestrial networks operate in the same frequency band. Interferences within the frequency band are dynamically managed thanks to appropriate mitigation techniques which manage the spectrum resource between systems. |

### Hybrid system advantages

- Increase in system flexibility covering more applications
- Truly ubiquitous solutions
- Higher level of interoperability
- Improved spectrum efficiency
- Cost reduction in radio components
- Easier adoption of IoT applications
- New opportunities for innovation



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# Draft ECC report on M2M via satellites (6/8)

## *New hybrid IoT systems based on SRD framework*

- The development of terrestrial Low Power Wide Area Networks (LPWAN) operating in SRD bands has triggered interest for complementary services by satellite systems dedicated to low power and low data rate devices.
- Initial conclusion from WGFM CG on M2M via satellite indicates that various NGSO constellations could be designed and operated that would allow for such hybrid satellite and terrestrial systems.
- More contributions on this approach are expected during next FM44 meeting
- From a regulatory perspective it is to date noted that if the conditions applicable to Earth-to-space transmissions from low power SRD devices is first an national matter, space-to-Earth transmission may be not possible in absence of satellite allocation overlapping with existing frequency bands Identified for SRD applications.
- In addition, in light to the last revision of the Rules of Procedure, the use of the provision 4.4 is not considered as an appropriate regulatory tool to operate downlink transmission from commercial satellite systems in SRD bands

# Draft ECC report on M2M via satellites (7/8)

## *Preliminary findings*

- **A vibrant ecosystem of M2M services are provided via stand-alone satellite terminals** of various types and in multiple network configurations in almost all main satellite frequency bands
- **Further review of ECC decisions and harmonized implementation** of ECC decisions by CEPT administration **may benefit the provision of such services**
- **Solutions already exist for dual mode hybrid terminals which could benefit from further standardization work** to enhance interoperability between systems
- **The development of fully integrated systems in existing co-primary allocations** to terrestrial and space services **or SRD bands could be envisioned although difficult issues remain to be clarified first** ( e.g. operation under provision 4.4 in SRD bands, sharing conditions to protect exiting systems, specific licensing regime).
- **For emerging systems, alternative frequency bands could have to be found** in order to facilitate the development of IoT services via stand-alone satellite or hybrid systems

# Draft ECC report on M2M via satellites (8/8)

## *Next steps and meeting schedule*

- FM44 - 15/05/19 : Should be the last drafting meeting
- WGFM - 03/06/19 : Review before public consultation
- Public Consultation
- FM44 - 17/09/19 : PC result and subsequent report upgrades
- WGFM - 10/02/20 : Planned date for validation



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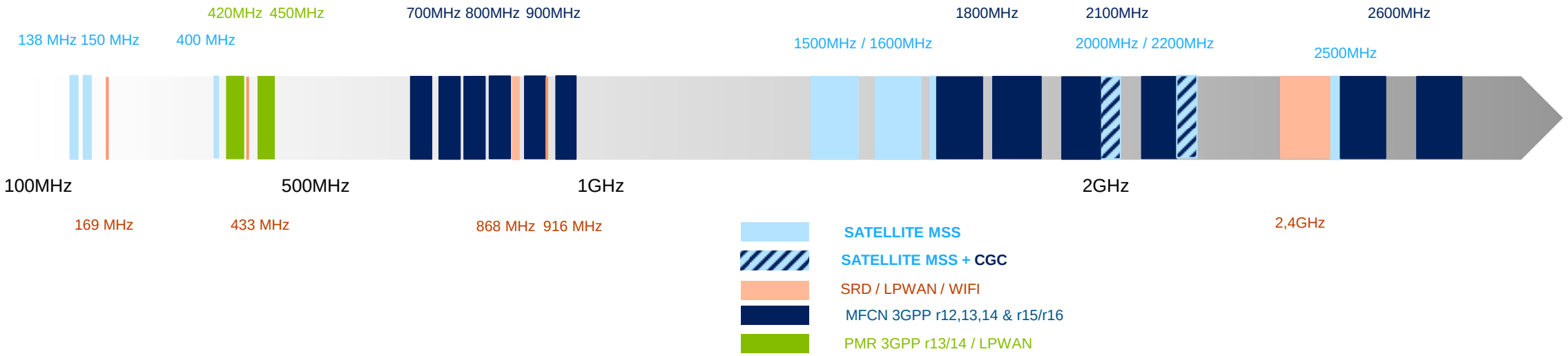
# Panorama of ECC activities related to M2M and IoT

- ECC Report 200, ECC Report 246, Addendum to CEPT Report 59 (LPWAN/RFID), ERC REC 70-03 : SRD bands
- ECC report 242, CEPT Report 53 and ECC Decision (15)01 : M2M option in the 733-736 MHz and 788-791 MHz
- ECC Report 266, CEPT Report 66, ECC Decision (06)13 amended : NB-IoT and LTE-M in MFCN bands below 3 GHz,
- ECC report 280 5G by satellite,
- ECC Report 283 :Compatibility and sharing studies on broadband and narrowband systems in the bands 410-430 MHz and 450-470 MHz
- ECC Report 292 Current Use, Future Opportunities and Guidance to Administrations for the 400 MHz PMR/PAMR frequencies
- ECC/DEC/(19)02 Land mobile systems in the frequency ranges 68-87.5 MHz, 146-174 MHz, 406.1-410 MHz, 410-430 MHz, 440-450 MHz and 450-470 MHz




**Ongoing Draft ECC report on M2M via satellite – Last contribution expected on 7 May 2019**



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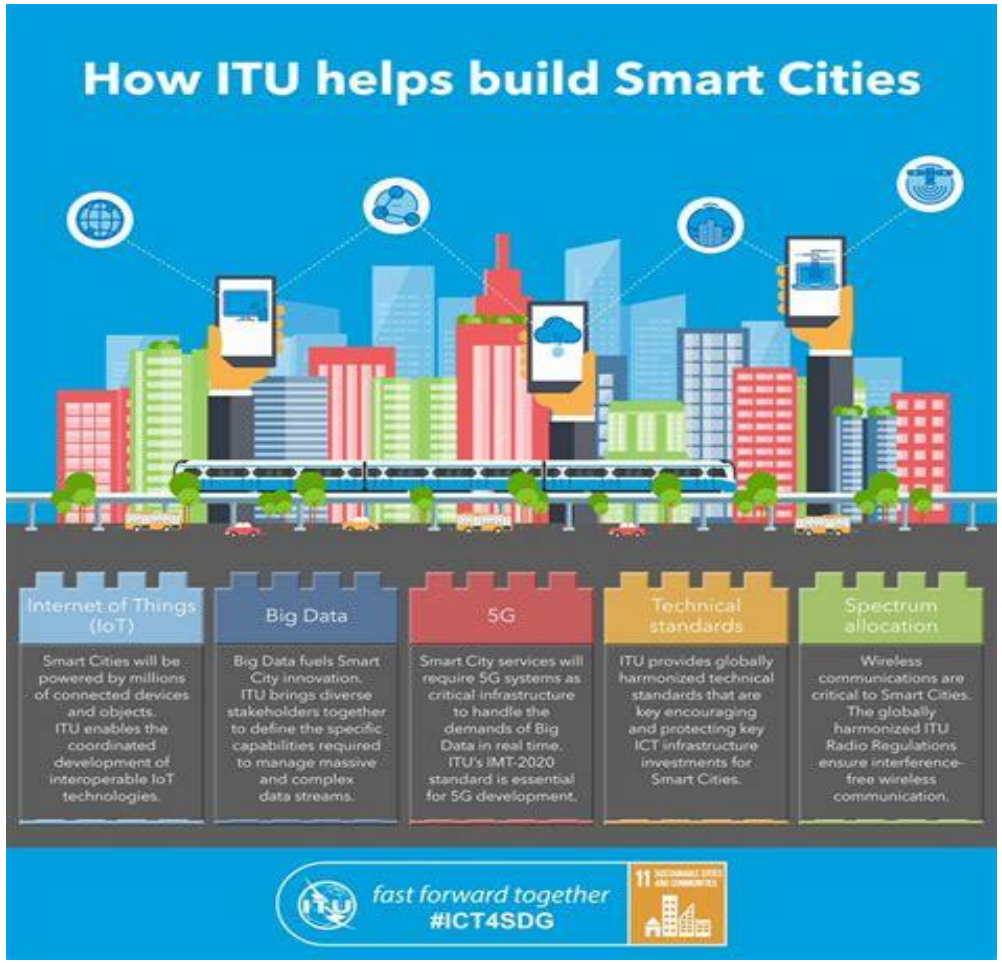
# Thank you

# M2M & Internet of Things beyond ECC framework




**PP-14** Resolution 197 (Busan, 2014), on Facilitating the Internet of Things to prepare for a globally connected world

**WSTA-16** Resolution 98 (Hammamet, 2016) - Enhancing the standardization of Internet of things and smart cities and communities for global development

**ITU-T SG20** issued a wide range of Recommendations including the ITU-T Y.2060 (06/2012) Overview of the Internet of things

**WTDC-17** Resolution 85 (Buenos Aires, 2017) - Facilitating the Internet of Things and smart cities and communities for global development

**RA-15** Resolution ITU-R 66**:** "Studies related to wireless systems and applications for the development of the Internet of Things";

**WRC-15** Resolution **958 (WRC-15)** – Annex item 3) Studies on the technical and operational aspects of radio networks and systems, as well as spectrum needed, including possible harmonized use of spectrum to support the implementation of narrowband and broadband machine-type communication infrastructures

**CPM-19-2 AI 9.1 issue 8 conclusion : there is no need for any regulatory action in the Radio Regulations with regard to specific spectrum for use by MTC applications. Harmonization can be addressed through ITU-R SG.**

- **Report ITU-R M.2440-0** The use of the terrestrial component of IMT for Narrowband and Broadband MTC
- **PDN Report ITU-R M.**[NON_IMT.MTC_USAGE]



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